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(54) **DUAL REAMER HOLDER FOR SURGICAL USE**

HALTER FÜR ZWEI UNTERSCHIEDLICHE CHIRURGISCHE FRÄSER

DOUBLE PORTE-ALESOIR POUR UTILISATIONS CHIRURGICALES

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Description

BACKGROUND OF THE INVENTION

[0001] This invention relates to surgical tool holders, and more particularly, to holders of rotary surgical cutting tools.

[0002] Surgical tools and their respective holders have to be kept clean and sterile before any use in a hospital environment in order to minimize risk of transfer of disease or infection from patient to patient following the emergence of certain "prions" that are not killed by normal hospital sterilization and thus need to be physically removed through washing and rinsing. A surgical tool, for example for preparing for the fitting of a hip prosthesis, works in a medium which causes considerable soiling of the tool and of the tool holder. Despite the importance of doing so, the thorough cleaning of these devices is difficult. Surgical tool holders of the prior art are designed such that washing and rinsing are generally not an effective way of cleaning the tool. This is due to the small spaces left between component parts which allow only minimal access by cleaning agents.

[0003] Further, among the many different styles of reamers used by surgeons in orthopaedic surgical operations, there are two that are particularly pervasive, yet which present different interfaces to the holders, thus not permitting a single reamer holder to be able to fasten to the two different interfaces.

[0004] The first such reamer style is described in US Patent No. 6,264,647 to Lechot. This patent describes a reamer holder which is made up of a shank having a central axis, a first driveable end and second coupling end. The second end includes a coupling device which couples to a corresponding structure of a reamer tool and holds such tool in functional assembly to the shank by a releasable locking mechanism. The releasable locking mechanism has a locking sleeve slideably disposed about the shank, a spring biased against a capture sleeve by the locking sleeve, and a connection device retaining the locking sleeve in a fixed position during use. Release of the connection device enables quick disassembly of the locking sleeve, spring and capture sleeve for cleaning and component sterilization. The releasable locking mechanism is adapted to secure a bar of a surgical tool in which the diametral bar extends across a bottom tool driver opening. Such a connection is known as a PRECIMED™-type connection.

[0005] A second reamer style is described in EP1066796 to Othy Inc. This patent describes a tool driver similar to that of US Patent No. 6,264,647 to Lechot in that it has a shaft with a longitudinal axis and opposite ends. A coupling device is secured at one of the shaft ends by which the tool driver is connected to a rotary tool. The coupling device is equipped with a securing device of the bayonet type having a latch mechanism which holds the rotary tool on the boss coaxially of the driver during use. In a specific embodiment, the securing device

has a tapered bore extending from the distal end of the coupling device axially of the shaft. The rotary tool has a bar extending across a bottom tool driver opening with a centrally located circular disk therein. Such a rotary tool is known as having a bar-with-a-boss- or OTHY™-type connection. The disk of the rotary tool fits within the bore of the tool shaft boss so as to concentrically locate the rotary tool and the tool shaft on the same axis. The latch mechanism holds the tool driver and the tool together in this position, whereby rotary tools of a multitude of sizes can be secured concentrically to the tool shaft without holding a plurality of critical tolerances when machining the bayonet type securing device or the rotary tool bottom bar.

[0006] Thus, it is necessary that the two reamers each have a dedicated holder, which adds to the bulk and expense of surgical tool kits.

[0007] What is needed therefore is a surgical tool holder which is quickly and simply disassembled for cleaning and sterilization. Still further, what is needed is a dual reamer holder capable of holding the two different styles of reamers which are pervasively used in orthopaedic surgery.

SUMMARY OF THE INVENTION

[0008] The surgical tool holder of the invention has a shank having first driveable end and second coupling end, a coupling device mounted on the coupling end, and a locking mechanism. The coupling device has an interface thereon for receiving a tool, and includes two interfaces for mating with corresponding structures on the inside of an OTHY™ bar-boss as well as a PRECIMED™ cross-bar hollow surgical reamer. The locking mechanism is made up of an annular capture component, a spring, a locking sleeve which slides on the shank, and a locking device. The capture component is mounted so as to slide along the shank and includes two pairs of longitudinally protruding pins, the matching pin to the pair being positioned 180 degrees apart. In a preferred configuration, the four pins are spaced apart evenly on a circle centered on the axis of the shank.

[0009] The locking device cooperates with the capture component so as to lock the tool onto the interface. The spring biases the capture component in a locking direction and bears on the locking sleeve. The locking sleeve is disengageably lockable to the shank via a connection device. The connection device is preferably a bayonet mechanism.

[0010] The object of the invention is to enable quick disassembly for cleaning and component sterilization.

[0011] Another object of the invention is to provide one holder capable of holding the two pervasively used hollow reamers.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The attached drawings show embodiments of

the invention by way of example.

FIG. 1 is an exploded view of the tool holder of the invention, adjacent tools to which the holder interfaces.

FIG. 2 is an assembled, perspective view of a tool holder of the invention.

FIG. 3 is a perspective view of the tool holder of the invention holding an "OTHY"TM-type tool.

FIG. 4 is a perspective view of the tool holder of the invention holding a "PRECIMED"TM-type tool.

FIG. 5 is a perspective view of the tool holder of the invention, showing a lead-in chamfer to facilitate the insertion of a tool.

FIG. 6 is a perspective view of a tool kit of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0013] Referring now to FIG. 1, the dual surgical reamer holder 10 of the invention is shown. The holder 10 connects to a surgical tool 12 or 12' to enable controlled manipulation of that tool. The holder 10 has a shank 14 having a coupling end 16, a drive interface 20 attached to an opposite end 22 (shown in phantom lines) of the shank (to which a handle 11 such as that shown in FIG. 6 is generally attached), a coupling device 24 and a locking mechanism 26. The coupling end 16 has a series of bayonet grooves 30 therein, cut transverse to the central axis 27 of the shank 14, for receiving a cross bar 31 of the tool 12. The locking mechanism 26 is made up of a capture sleeve 32, a helical compression spring 34, a locking sleeve 36 all of which slide along the shank 14, and pin receiving holes 35. Preferably, to ensure that the tool 12' is retained in an axially aligned relationship with the holder 10, a central recess 41 capable of receiving a boss 11 on the tool 12 is centrally disposed in the coupling end 16 of the shank 14.

[0014] The annular capture sleeve 32 mounts so as to slide along the shank 14. Pins 33 are mounted in the capture sleeve 32 and enter into the corresponding holes 35 in the coupling end 16, thus preventing relative rotation of the sleeve 32 with respect to the shank 14.

[0015] Tool 12 has centering bars 40, also known as cross bars 31, which are received into recesses 55 in the capture sleeve 32, and then locked into the recesses when the capture sleeve is biased up the shank into a locked position, thus ensuring that the cross bar is locked into the bayonet groove 30. Note that each groove 30 has a recess 53 in order to capture cross bars 31. The spring 34 biases the capture sleeve 32 in a locking direction, bearing against the locking sleeve 36. The lock-

ing sleeve 36 is disengageably lockable to the coupling end 16 of the shank 14 via a bayonet mechanism, which includes a bayonet slot 50 and a locking pin 52. The bayonet slot 50 is cut in the coupling end 16 of the shank 14. The locking pin 52 is press fit into the locking sleeve 36.

[0016] The locking sleeve 36 locks over the shank 14 near the coupling end 16. The shank 14 has a longitudinal groove 37 within which the bayonet pin 52 slides so as to enable the locking pins 52 or 52' to freely slide along the shank 14 when the locking sleeve is unlocked and slid back along the shank, in order to provide cleaning access to all surfaces of the locking mechanism 26.

[0017] Referring now to FIGs. 2 - 4, all recesses 30 receive the cross bar 31 of the PRECIMEDTM tool 12 (shown in FIG. 4) and specialized recesses 30' receive the boss 11 and rectangular arm 13 (shown in FIG. 3) of the OTHYTM reamer 12'. Note that the recesses 30' include a narrow rectangular arm receiving portion 53. Further, pins 52' include small nipples 58 on their ends, which enable the pins to lock in the cross bars 31 more fully, while rising along the shank 14 to the same position (approximately) as is the case when the arms 13 of the "OTHY" product are captured, thus ensuring that the visual impression of locking is consistent when locking either product into the holder 10, despite the different geometric configuration of the interfaces. Thus, the current embodiment requires that the user place the arm 13 of the "OTHY"TM-type tool in the appropriate corresponding recesses 30'.

[0018] The pins 33 and 33' are chamfered or tapered in order to wedge the rectangular arm 13 or the bar 31 into the corresponding recesses 53 or 55 respectively, so as to eliminate play.

[0019] Referring now to FIG. 5, optionally, chamfered surfaces 60 facilitate the insertion of the rectangular arm 13 or the bar 31 into the corresponding recesses 30 or 30'.

[0020] In operation, the cross bar 31 or the bar 13 enters the appropriate bayonet groove 30 or 30' and is turned so as to move into the recess 55 or the receiving portion 53, as the case may be. The tool 12 or 12' is locked in this position when the capture sleeve 32 is raised into a position in which the pins 33 and 33' pass through the holes 35 and into recesses 30 and 30' of the holder 10 so as to lock the tool in place inside the recess.

[0021] To unlock the holder 10, the locking sleeve 36 is urged against the bias of spring 34 so as to lift it out of a bayonet seat 51, and then twisted so as to move the pin 52 out of the bayonet slot 50 in the coupling end 16 of the shank 14. The locking sleeve 36 may then be slid back along the shank 14, releasing the spring 34 and the sleeve 32, and thereby providing cleaning and sterilization access to the recesses that might otherwise not be accessible.

[0022] Referring now to FIG. 6, a kit 150 is shown, including the tool holder 10, a PRECIMEDTM-type reamer 130, an OTHYTM-type reamer 132, and specialized reamers 134. The components of the kit 150 are organized in a case 160 for convenience.

[0023] In an advantage of the invention, the bayonet mechanism holds the locking sleeve 36 and thus the spring 34 in an operational position, as well as enabling quick disassembly for cleaning and component sterilization.

[0024] In another advantage of the invention, the holder is adapted to hold more than one tool interface, thus minimizing the bulk and weight of a surgeon's tool kit.

[0025] In another advantage, the holder 10 of the invention minimizes play and maximizes alignment with the turning axis 27.

[0026] In another advantage, a kit is provided which presents the tool holder 10 and related components to the surgeon in a convenient, organized fashion.

[0027] Although illustrative embodiments of the invention have been shown and described, a wide range of modification, change and substitution is contemplated in the foregoing disclosure and in some instances, some features of the present invention may be employed without a corresponding use of the other features. The elastic devices used of course can be selected from a large variety of equivalents to a helical, compression spring, including, for example, leaf springs, flat springs, multiple compression springs, just to name a few. Still further, the connection mechanism can be substituted for a variety of connection mechanisms such as a threaded connection mechanism, a clasp, spring detents, or even magnetic retention devices.

Claims

1. A surgical tool holder (10) comprising a shank (14) having a central axis (27), a first driveable end and second coupling end, the second end comprising a coupling device (24) comprising two pairs of bayonet interfaces consisting of four grooves (30,30'), each having a recess (55) being adapted to capture a respective bar (40) of a cross bar (31) of a first type (12') of reamer tool in order to couple with corresponding structure of said first type of reamer tool (12, 12', 139) and, together with a releasable locking mechanism, hold such tool in functional assembly to the shank, the releasable locking mechanism (26) comprising a locking sleeve (36) slideably disposed about the shank, a spring (34) biased against a capture sleeve (32) by the locking sleeve, and a connection device (50) retaining the locking sleeve in a fixed position during use, whereupon release of the connection device enables quick disassembly of the locking sleeve, spring and capture sleeve for cleaning and component sterilization, the holder **characterized in that** two grooves (30') of the four grooves (30, 30') of the coupling device (24) further have narrow rectangular arm receiving portions (53) in order to couple with corresponding structure of a second type (12) of reamer tool so as to enable the holder (10) to mate with corresponding structures of at least

two types of reamer tools (12, 12'), at the selection of the user.

2. The surgical tool holder of claim 1, wherein the capture sleeve (32) is longitudinally slideable along the shank (14), constrained to rotate with the shank and presenting longitudinally protruding pin pairs (33, 58), each pair being disposed about a circle centered on the axis of the shank and capable of passing through openings (35) in the coupling end of the shank and then into the holder recesses (30, 30') so as to block a selected reamer tool (12, 12') in the corresponding holder recesses.
3. The surgical tool holder of claim 1, wherein a handle (11) is attached to the driveable end of the shank (14).
4. The surgical tool holder (10) of claim 2, wherein when the locking sleeve (36) is unlocked and slid back along the shank (14), cleaning access to all surfaces of the locking mechanism (26) is facilitated.
5. The surgical tool holder of claim 1, wherein a first interface (30) mates with a cross bar reamer (12').
6. The surgical tool holder (10) of claim 1, wherein a second interface (30') mates with a bar boss reamer (12).
7. The surgical tool holder (10) of claim 1, wherein the spring (34) is a helical compression spring.
8. The surgical tool holder (10) of claim 1, wherein the connection device (50) is a bayonet mechanism.
9. The surgical tool holder (10) of claim 8, wherein the bayonet mechanism is comprised of a bayonet slot (50) and a locking pin (52).
10. The surgical tool holder (10) of the claim 9, wherein the bayonet slot is disposed on the shank.
11. A tool kit (150) for surgical use, the tool kit including at least the following components:
 - (a) a surgical tool holder (10) according to claim 1;
 - (b) at least one tool (12., 12', 134) selected from a group of tools consisting of cross bar reamers (12'), bar boss reamers (12), and specialized reamers (134); and .
 - (c) a case (160) for receiving the tool holder (10) and the at least one tool (12, 12', 134).

Patentansprüche

1. Halter (10) für ein chirurgisches Werkzeug mit einem Schaft (14), der eine mittlere Achse (27), ein erstes antreibbares Ende und ein zweites Koppelende aufweist, wobei das zweite Ende eine Koppelvorrichtung (24) mit zwei Paar Bajonettschnittstellen aus vier Nuten (30, 30') aufweist, die jeweils eine Aussparung (55) haben, die dazu geeignet ist, eine jeweilige Schiene (40) einer Kreuzschiene (31) einer ersten Art von Fräserwerkzeug zu fassen, um eine Koppelung mit einer entsprechenden Struktur der ersten Art von Fräserwerkzeug (12, 12', 139) durchzuführen und zusammen mit einem lösbaren Verriegelungsmechanismus ein solches Werkzeug in funktionaler Anordnung mit dem Schaft zu halten, wobei der lösbare Verriegelungsmechanismus (26) eine verschiebbar um den Schaft angeordnete Verriegelungshülse (36), eine durch die Verriegelungshülse gegen eine Fasshülse (32) vorgespannte Feder (34) und eine die Verriegelungshülse während des Gebrauchs in einer festen Position haltende Verbindungsvorrichtung (50) aufweist, wobei durch Lösen der Verbindungsvorrichtung eine schnelle Demontage der Verriegelungshülse, der Feder und der Fasshülse zur Reinigung und Bestandteilsterilisierung ermöglicht wird, wobei der Halter **dadurch gekennzeichnet ist, dass** zwei Nuten (30') der vier Nuten (30, 30') der Koppelvorrichtung (24) ferner schmale, rechteckige Armaufnahmeabschnitte (53) haben, um eine Koppelung mit einer entsprechenden Struktur einer zweiten Art (12) von Fräserwerkzeug durchzuführen, damit der Halter (10) mit entsprechenden Strukturen von mindestens zwei Arten von Fräserwerkzeugen (12, 12') nach der Wahl des Benutzers zusammenpassen kann.
2. Halter für ein chirurgisches Werkzeug nach Anspruch 1, wobei die Fasshülse (32) in Längsrichtung entlang dem Schaft (14) geschoben werden kann, sich gezwungenermaßen mit dem Schaft dreht und in Längsrichtung vorragende Stiftpaare (33, 58) darbietet, wobei jedes Paar um einen Kreis angeordnet ist, dessen Mitte die Schaftachse ist, und in der Lage ist, durch Öffnungen (35) im Koppelende des Schafts und dann in die Halteraussparungen (30, 30') zu gehen, um ein gewähltes Fräserwerkzeug (12, 12') in den entsprechenden Halteraussparungen zu blockieren.
3. Halter für ein chirurgisches Werkzeug nach Anspruch 1, wobei ein Griff (11) am antreibbaren Ende des Schafts (14) angebracht ist.
4. Halter (10) für ein chirurgisches Werkzeug nach Anspruch 2, wobei Reinigungszugriff auf alle Flächen des Verriegelungsmechanismus (26) erleichtert ist, wenn die Verriegelungshülse (36) entriegelt und ent-

lang dem Schaft (14) zurückgeschoben wird.

5. Halter für ein chirurgisches Werkzeug nach Anspruch 1, wobei eine erste Schnittstelle (30) mit einem Kreuzschiene fräser (12') zusammenpasst.
6. Halter (10) für ein chirurgisches Werkzeug nach Anspruch 1, wobei eine zweite Schnittstelle (30') mit einem Schienenbuckelfräser (12) zusammenpasst.
7. Halter (10) für ein chirurgisches Werkzeug nach Anspruch 1, wobei es sich bei der Feder (34) um eine Schrauben-Druckfeder handelt.
8. Halter (10) für ein chirurgisches Werkzeug nach Anspruch 1, wobei es sich bei der Verbindungsvorrichtung (50) um einen Bajonettmechanismus handelt.
9. Halter (10) für ein chirurgisches Werkzeug nach Anspruch 8, wobei der Bajonettmechanismus einen Bajonettschlitz (50) und einen Verriegelungsstift (52) aufweist.
10. Halter (10) für ein chirurgisches Werkzeug nach Anspruch 9, wobei der Bajonettschlitz am Schaft angeordnet ist.
11. Werkzeugsatz (150) für die Verwendung in der Chirurgie, wobei der Werkzeugsatz mindestens die folgenden Bestandteile aufweist:
 - (a) einen Halter (10) für ein chirurgisches Werkzeug nach Anspruch 1,
 - (b) mindestens ein Werkzeug (12, 12', 134), ausgewählt aus einer Gruppe von Werkzeugen aus Kreuzschiene fräsern (12'), Schienenbuckelfräsern (12) und Spezialfräsern (134), und
 - (c) ein Gehäuse (160) zum Aufnehmen des Werkzeughalters (10) und des mindestens einen Werkzeugs (12, 12', 134).

Revendications

1. Support d'outil chirurgical (10) comportant une verge (14) dotée d'un axe de symétrie (27), une première extrémité pouvant être entraînée et une deuxième extrémité d'accouplement, la deuxième extrémité comportant un dispositif d'accouplement (24) comportant deux paires d'interfaces à baïonnette consistant en quatre rainures (30, 30'), chacune dotée d'une encoche (55) adaptée pour recevoir une barre (40) correspondante d'un croisillon (31) d'un premier type d'outil alésoir afin de s'accoupler avec une structure correspondante dudit type d'outil alésoir (12, 12', 139) et, en conjonction avec un mécanisme de verrouillage débloable, de maintenir cet outil en un ensemble fonctionnel avec la verge, le mécanis-

- me de verrouillage débloable (26) comportant un manchon de verrouillage (36) disposé de façon coulissante autour de la verge, un ressort (34) comprimé contre un manchon d'accrochage (32) par le manchon de verrouillage, et un dispositif de connexion (50) retenant le manchon de verrouillage dans une position fixe pendant l'utilisation, suite à quoi le déblocage du dispositif de connexion permet le démontage rapide du manchon de verrouillage, du ressort et du manchon d'accrochage pour le nettoyage et la stérilisation des composants, le support étant **caractérisé en ce que** deux rainures (30') parmi les quatre rainures (30, 30') du dispositif d'accouplement (24) sont en outre dotées de portions rectangulaires étroites (53) recevant des bras afin de s'accoupler avec une structure correspondante d'un deuxième type (12) d'outil alésoir de manière à permettre au support (10) de s'adapter aux structures correspondantes d'au moins deux types d'outil alésoir (12, 12') au choix de l'utilisateur.
2. Support d'outil chirurgical selon la revendication 1, le manchon d'accrochage (32) étant susceptible de coulisser longitudinalement le long de la verge (14), contraint de tourner avec la verge et présentant des paires d'ergots (33, 58) faisant saillie longitudinalement, chaque paire étant disposée au long d'un cercle centré sur l'axe de la verge et capable de passer à travers des ouvertures (35) dans l'extrémité d'accouplement de la verge puis dans les encoches du support (30, 30') de manière à bloquer un outil alésoir choisi (12, 12') dans les encoches correspondantes du support.
 3. Support d'outil chirurgical selon la revendication 1, une poignée (11) étant fixée à l'extrémité de la verge (14) pouvant être entraînée.
 4. Support d'outil chirurgical (10) selon la revendication 2, l'accès en vue du nettoyage de toutes les surfaces du mécanisme de verrouillage (26) étant facilité lorsque le manchon de verrouillage (36) est déverrouillé et glissé vers l'arrière le long de la verge (14).
 5. Support d'outil chirurgical selon la revendication 1, une première interface (30) s'adaptant à un alésoir à croisillon (12').
 6. Support d'outil chirurgical (10) selon la revendication 1, une deuxième interface (30') s'adaptant à un alésoir du type "barre à plots" (12).
 7. Support d'outil chirurgical (10) selon la revendication 1, le ressort (34) étant un ressort hélicoïdal de compression.
 8. Support d'outil chirurgical (10) selon la revendication 1, le dispositif de connexion (50) étant un mécanisme à baïonnette.
 9. Support d'outil chirurgical (10) selon la revendication 8, le mécanisme à baïonnette étant constitué d'une fente de baïonnette (50) et d'une goupille de verrouillage (52).
 10. Support d'outil chirurgical (10) selon la revendication 9, la fente de baïonnette étant ménagée sur la verge.
 11. Trousse à outils (150) à usage chirurgical, la trousse à outils comprenant au moins les composants suivants :
 - (a) un support d'outil chirurgical (10) selon la revendication 1 ;
 - (b) au moins un outil (12, 12', 134) choisi dans un groupe d'outils consistant en alésoirs à croisillon (12'), en alésoirs du type "barre à plots" (12) et en alésoirs spécialisés (134) ; et
 - (c) un coffret (160) destiné à recevoir le support d'outil (10) et le ou les outils (12, 12', 134).

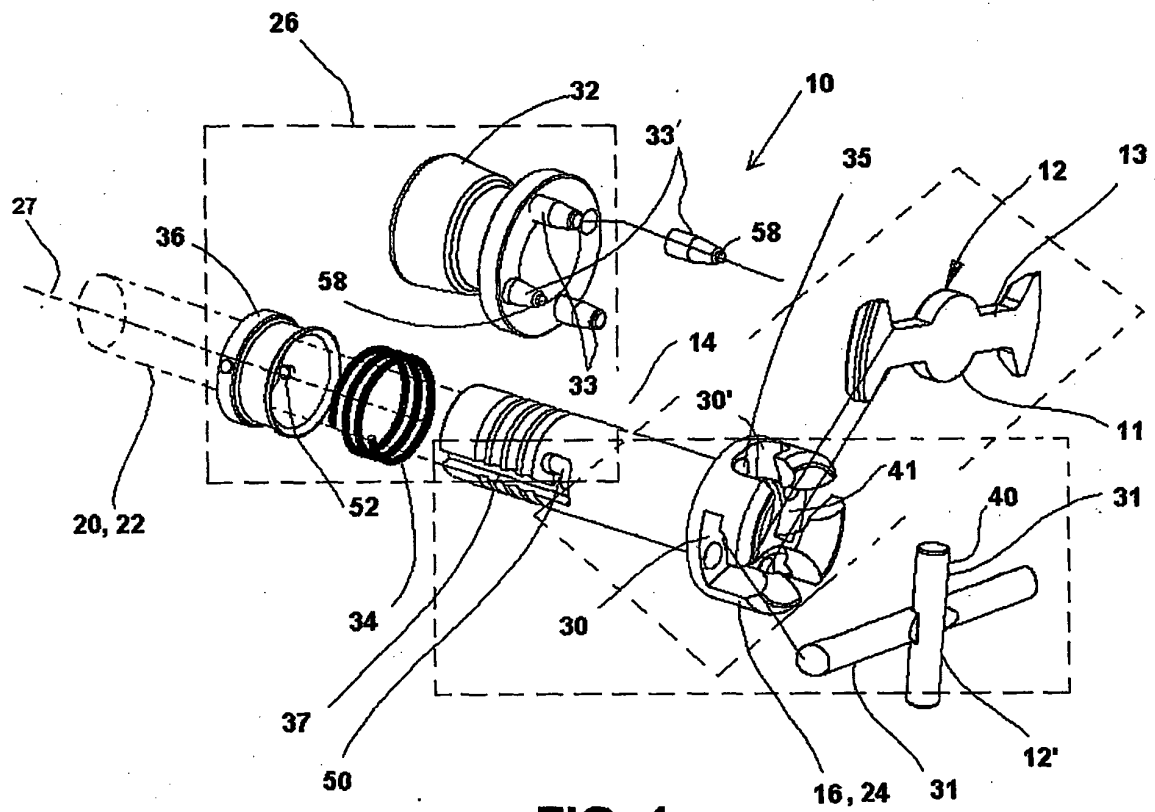


FIG. 1

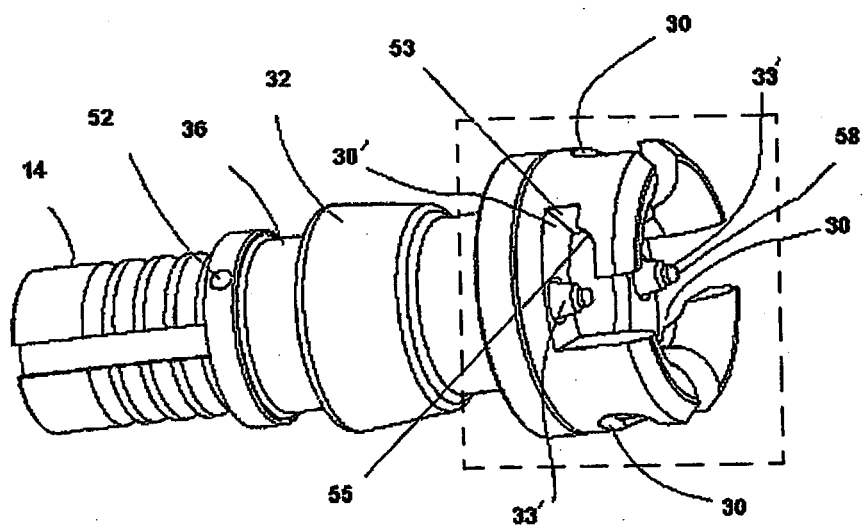


FIG. 2

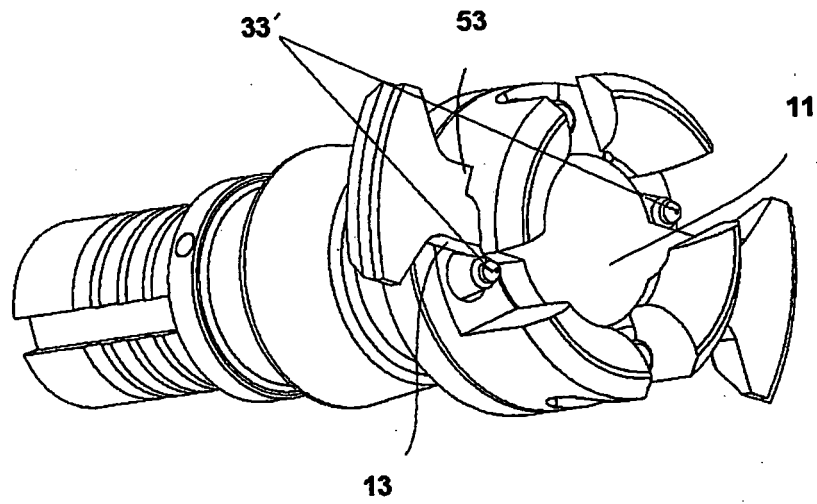


FIG. 3

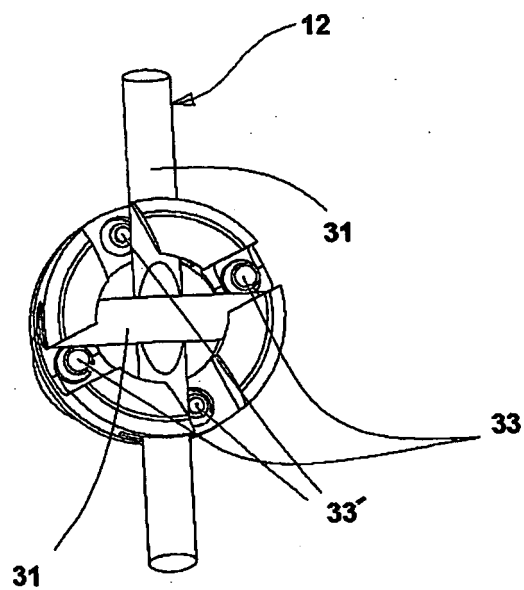


FIG. 4

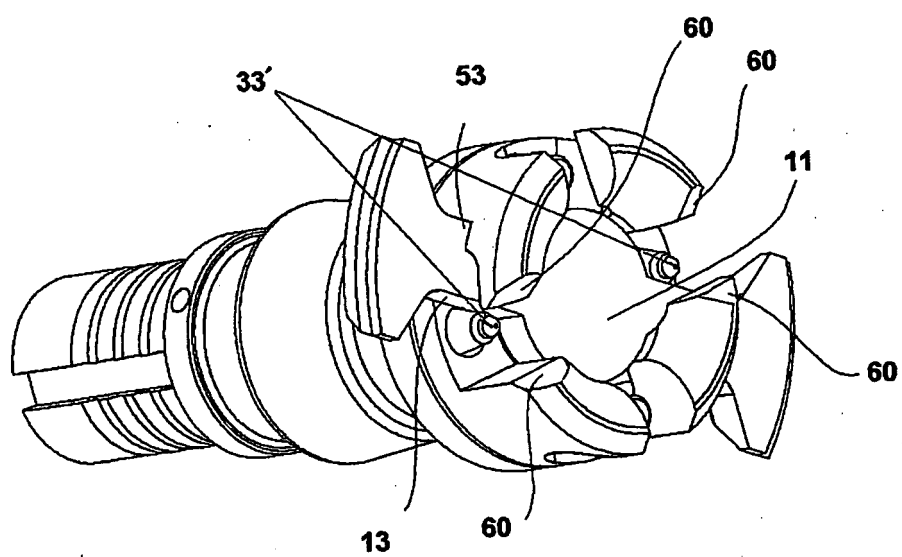


FIG. 5

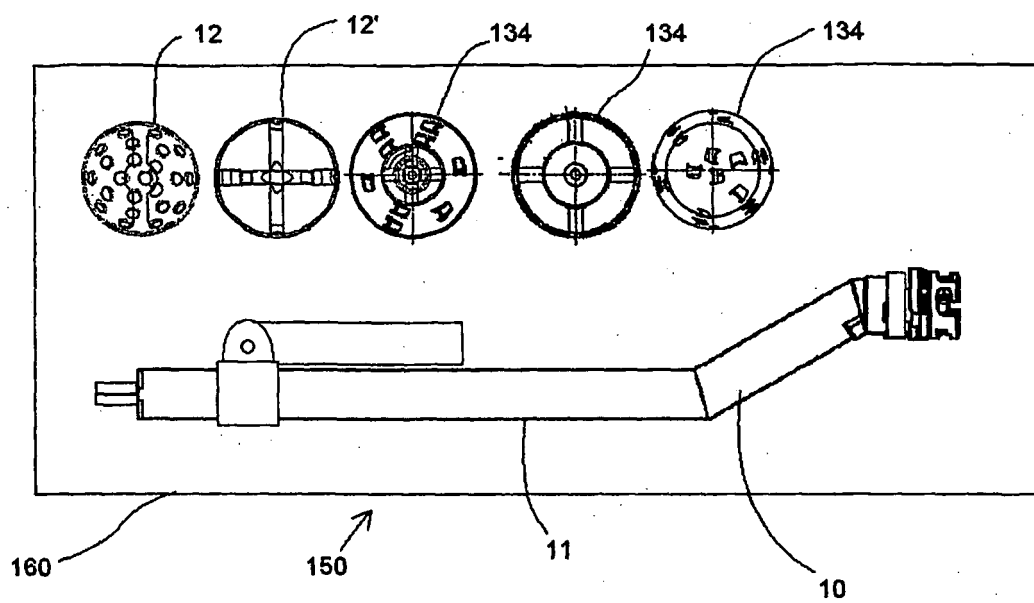


FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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